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Green Intellectual Capital and Firm Competitive Advantage: Evidence from Malaysian Manufacturing Firms

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Abstract

The purpose of this study is to investigate the relationship between green intellectual capital and firms' competitive advantage in Malaysia. More specifically this study examines the impact of four dimensions of green intellectual capital; green human capital, green innovation capital, green organisational capital and green relational capital on firms' competitive advantage. Using survey as a method to collect data from 224 managers of manufacturing firms in Malaysia, the result shows that green intellectual capital and its dimensions, specifically the green innovation capital, green organizational capital and green relational capital have significant and positive relationship with firms' competitive advantage. Overall, the findings highlight the importance of green intellectual capital as a valuable business resource which in turn enhances firm performance and competitiveness.

Keywords: Green intellectual capital; Competitive advantage; Manufacturing firms; Malaysia.

1. Introduction

Corporate sustainability issues have received much attention in the light of sustainable development, emphasis on social, environmental and financial aspects. Elkington (2001), argues that a sustainable business should support the growth of tangible and intangible forms of capital, including human, cultural and natural. It is because to create sustainable value, such firms should not only manage the explicit natural capital, but also the intangibles resources or assets including environmental resources (Claver-Cortés *et al.*, 2007).

In the present knowledge economies where value is added on their intellectual capital, rather than tangible assets and financial resources, the way firms resolve the environmental management issues while striving for corporate sustainability is greatly influenced on how firms mobilising their intellectual capital (Dunphy *et al.*, 2007; Wasiluk, 2013). Indeed, the increase in market value of the firms is also contributed by management of knowledge related to environmental management that is capable to offer higher added-value of green product and services (Claver-Cortés *et al.*, 2007; Huang and Kung, 2011).

The discussion of the paper is triggered by the failure of the traditional financial statement to measure the non-financial information such as intangible environmental resources and to capture their linkage with performance in the sustainability report (Amir and Lev, 1996; Eccles *et al.*, 2001; Krzus, 2011). Even though the integrated reporting approach require firms to describe such linkages, but how these resources create business values does not clearly explained (Accounting Today Editorial Team, 2014). To make successful decisions, management, investors and other stakeholders need information about value drivers (Krzus, 2011). Lack of information on intangible environmental resources as value drivers in this competitive age may cause firms to evaluate the environmental resources as unnecessary investment. Consequently, firms will suffer losses as the value they bring to the business is not fully appreciated. Current study postulate that green intellectual capital is an important intangible environmental resources that has the ability to drive firms into competitive advantage. Despite previous studies that make novel contribution to this theme, the indicators and evidence on the linkage between green intellectual capital and competitive advantage is still lacking. Therefore, this study is carried out to investigate the relationship between green intellectual capital and competitive advantage in a developing country like Malaysia.

The remainder of the paper is organized as follows. Section two provide a literature review related to green intellectual capital and competitive advantage. Section three draws a connection between green intellectual capital and competitive advantage and develops the research hypotheses. Section four elaborates the research design. Section five presents and discusses the findings. The final section provides the summary and conclusions.

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2. Literature Review

The intellectual capital can be summarised as sum of all knowledge serves as strategicresource that can create value and ensure competitive advantage (Youndt *et al.*, 2004). Most scholars classified intellectual capital into human capital, structural capital and relational capital (Bontis, 1999a; Johnson, 1999; Juma, 2005). Edvinsson and Malone (1997), have classified intellectual capital into four categories, where the structural capital have been separated into innovation capital and process capital. Wang and Chang (2005) and Tseng and Goo (2005) later adopted the four categories of intellectual capital in their research. Eachintellectual capital construct needs to interact with each other and also other resources to create value (Bontis *et al.*, 2000; Marr *et al.*, 2004a; Wang and Chang, 2005). The environmental management in the current study is interpreted as technical and organizational activities conducted by the firm to minimise the adverse environmental effects of the entire operation (Cramer, 1998; Klassen and McLaughlin, 1996).

Firms managed to gain benefit of competitive advantage when they are able to obtain greater economic benefits than their competitors (Porter, 1985). Day and Wensley (1988), highlight five areas of key competitive advantage indicators including low cost position, differentiation, market share and profitability. Firms committed to social and environmental responsibilities will improve environmental performance and raise a good reputation, which is generally aligned with improved competitive advantage (Huang and Kung, 2011). The resource based theory (RBV) posits that competitive advantage is a result of strategy implementation that is currently not used by competing firms, which helps reduce costs, exploit market opportunities, and neutralize competitive threats (Barney, 1991). Thus, the competitive advantage measures in the current study require respondents to compare their firm performance with the performance of the firm competitor based on five dimensions namely low cost position, differentiation, market share, profitability and corporate reputation.

The study integrates natural resource based view (NRBV) and intellectual capital to explain the relationship between green intellectual capital and its dimensions with firms' competitive advantage. The NRBV, an extension of RBV postulate that a basis for a competitive advantage of a firm lies primarily in the application of bundle of valuable, rare, inimitable resources and socially complex organisational process that facilitate environmentally sustainable economic activity (Hart, 1995). The intellectual capital resources recognised as value drivers towards firms' performance and competitive advantage due to their specific criteria's such as intangible, valuable, rare and inimitable resources (Bontis, 1998; Kamaluddin and Abdul Rahman, 2013; Marr *et al.*, 2004b; Roos and Roos, 1997).Thus, it is argued that the intellectual capital theory should be integrated into the NRBV to further explain that the bundle of natural resources used by companies to engage with the environmentally sustainable economic activity will form capabilities that enable firm to gain competitive advantage. The capabilities to carry out the sustainable economic activity generated from the interaction of each sub-dimension namely green human capital, green innovation capital, green organizational capital and green relational capital as strategic resources that drive firms into competitive advantage.

3. Hypotheses Development

3.1. Green Intellectual Capital and Competitive Advantage

In Malaysia, prior studies document that intellectual capital has positive association with firms 'performance (Bontis *et al.*, 2000; Kamaluddin and Abdul Rahman, 2009). Earlier studies in green intellectual capital focused on the development of green intellectual capital and individual indicators of green intellectual capital elements (Baharum and Pitt, 2009; Liu, 2010; Lopez-Gamero *et al.*, 2011). For example, study conducted by Chen (2008) has found that there was a positive relationship between green intellectual capital dimensions, namely green human capital, green structural capital and green relational capital with firms' competitive advantage. However, since the study was carried out in Taiwan, a developed country with advanced technology, the survey instrument may not be applicable to Malaysian setting. Green intellectual capital in Chen (2008) study limited to the scope of intellectual capital about green innovation, which means intellectual capital capabilities to carry out hardware and software innovation only. Therefore, current study proposed a new concept of green intellectual capital, which is based on literatures, focus group interviews and expert reviews refined in the methodology phases. Thus, current study describes green intellectual capitalasknowledge resources utilized by company to address the environmental issues in conducting business activities. Consequently, current study suggests that the creation and accumulation of green intellectual capital should be reflected in a firms' performance and hypothesized as follows:

H_1: There is a positive relationship between green intellectual capital and firms' competitive advantage.

3.1.1. Green Human Capital and Competitive Advantage

Human capital refers to the individual knowledge stock and collective capability of employees of an organization, which leads to optimum solutions (Bontis *et al.*, 2002; Tseng and Goo, 2005). Effective management of human capital such as investments in the knowledge and skills of employees and empowering them with necessary information to make decisions is a critical success factor for all organizations (Bontis, 1999b; Suraj and Bontis, 2012). A firm with more capable employees is presumed to gain higher profits than its competitors, which in turn positively affecting the firm's outcomes and its competitive advantage (Hitt *et al.*, 2001). Chen (2008), found that green intellectual capital is positively associated with competitive advantage of firms. Green human capital in the current study is highlighted as knowledge and competencies to address the environmental issues possessed by individuals, shared and communicated throughout the organization. Thus, it is hypothesized that:

H_{1a}: There is a positive relationship between green human capital and firms' competitive advantage.

3.1.2. Green Innovation Capital and Competitive Advantage

Innovation capital refers to the ability of a company to produce new knowledge, develop new products and creative ideas (Tseng and Goo, 2005). (Huang, 2005), Tseng and Goo (2005) and Wang and Chang (2005) found that there are positive effects between investments of innovation capital among Taiwanese manufacturers and performance. It is contended that innovation for green products and processes promotes product heterogeneity, enabling firms to develop new markets and setting prices higher than the market average, which in turn increase in competitive advantage and position themselves as market leaders (Hart, 1995; Hart and Milstein, 1999; Huang and Kung, 2011). Following the definition of Tseng and Goo (2005), current study defines green innovation capital as the ability of a company to generate new knowledge, new product and any creative ideas aimed at addressing the environmental issues (Yahya *et al.*, 2014). This leads to the formation of the following conjecture:

H_{1b}: There is a positive relationship between green innovation capital and firms' competitive advantage.

3.1.3. Green Organisational Capital and Competitive Advantage

Tseng and Goo (2005), described organisational capital as the actual environment established by a company to manage and generate its knowledge effectively. It is also classified as internal structures that indicate the infrastructure, processes and databases of the organisation, which enable the human capital to function as well as develop the organisation's image and culture (Cinquini *et al.*, 2012; Sveiby, 1997). No direct relationship between organisational capital and performance was found in an empirical investigation carried out by Tseng and Goo (2005). In contrast, Wang and Chang (2005) discovered that process capital has the strongest direct impact on performance. Current study highlights green organisational capital as the management and generation of knowledge in addressing the environmental issues effectively, that supports employees' productivity (Yahya *et al.*, 2014). Therefore, it is reasonable to come out with the following hypotheses:

H_{1c}: There is a positive relationship between green organizational capital and firms' competitive advantage.

3.1.4. Green Relational Capital and Competitive Advantage

Relational capital means knowledge related to interpersonal interactions, including internal and external relationships of an organization (Yahya *et al.*, 2014). Green relational capital involve firms' commitment to increase customer loyalty and satisfaction to increase sales on green products or services. In order to ensure the quality of green products and services offered by its suppliers, firms should maintain healthy interactions with suppliers to increase the number and value of supplier alliances (Huang and Kung, 2011). In Chen (2008) study, green relational capital emerged as the strongest dimension that has a positive impact on competitive advantage. Current study define green relational capital as knowledge embedded in relationships such as networking with relevant parties to address environmental issues. The hypotheses proposed here is:

H_{1d}: There is a positive relationship between green social capital and firms' competitive advantage.

4. Research Design and Methodology

4.1. Sample Selection and Data Collection

The population of this study comprises of manufacturing firms in Malaysia that become members of the Federation of Malaysian manufacturers (FMM). The manufacturing firms are chosen because they have been identified as one of the highest polluters of the environment through their supply chain activities such as procurement, production and distribution (Eltayeb *et al.*, 2011; Kuppusamy and Behrooz, 2015). Contribution of manufacturing sectors in Malaysia is relatively high, about 72.5% of overall country's export (MIDA, 2011). However, Malaysian manufacturing firms are pressured with green trade barriers and have to adhere to strict environmental regulations imposed by the exporters from developed countries such as the European Union (EU) and the United States. Therefore, failure to adhere the regulations may affect their profit and growth. Thus, investment in green intellectual capital is deemed important to ensure their competitiveness.

The sampling frame of the study was obtained from the FMM Directory of Malaysia Industries (2014). The unit of analysis of the study are managers. The respondents of the questionnaires were environmental managers, production managers, human resource managers and research and development managers, who were deemed knowledgeable and experienced in managing those related resources. The actual survey was conducted from August to October 2014. During data collection, snowball' sampling method was used to increase the sample size. Under this method, two questionnaires were sent to each company where the identified respondents were invited to help distributing another set of questionnaire to whom they know of having rich experience and knowledge in the areas specifically mentioned. A total of 1200 questionnaires were sent to 600 companies. Only 237 completed questionnaires were returned, represents 19.75% of response rate but only 224 were useful for the analysis.

4.2. Measurement of Variables

This study involves a self-designed instrument by developing measures for each variables. The measurement items are developed in several phases. The first phase starts with development of a preliminary checklist with detailed elements of green intellectual capital and competitive advantage. These items were extracted from the literatures and information derived from focus group interviews. The measures on green intellectual capital constructs in this study are adapted from intellectual capital, environmental management and green intellectual capital researches. The items in this study are adapted from intellectual capital, environmental management, green intellectual capital and business literatures. The focus group interviews were conducted in two sessions involving six

managers of manufacturing and green consultant companies. In the second phase, a draft of survey instruments was designed based on the preliminary checklists.

The draft was then reviewed by the experts, who are senior managers of private and public companies and academicians of local public universities. The purpose of seeking the expert reviews is to establish the questionnaire's content validity. Based on their comments and the authors' discussions, some modifications were made on the items of survey instrument. In the third phase, a pre-test was conducted to get feedback on the questionnaires items in terms of content, the level of the language, ambiguity of the questions and the layout of the survey forms. The questionnaires were distributed to manufacturing managers using convenience sampling. About twenty three questionnaires were collected and examined thoroughly. After some modifications, a pilot survey instrument was finally generated.

In the pilot study, a total of 630 questionnaires were distributed to 190 companies sent out by mail. Only 110 responses were successfully collected, rendering a response rate of 16.2 per cent. The purification of the instrument begins with the computation of Cronbach's alpha coefficient of reliability and exploratory factor analysis (EFA). The coefficient of reliability of the constructs range from 0.784 to 0.943, which exhibit internal acceptable consistency for real data collection. The dimensionality of the scale were examined to ensure the factor patterns emerged were independent of one another.

4.3. Operationalisation of the Dependent, Independent and Control Variables

4.3.1. Dependent Variable: Competitive Advantage

The data on competitive advantage, which serves as dependent variable in this study are measured using seven-point likert scale ranging from strongly disagree (1) to strongly agree (7). The main reason of varying the scale type is to reduce the method bias by making respondent more difficult to satisfice (Mackenzie and Podsakoff, 2012). As many as 12 items measuring competitive advantage are used in the survey, through respondents' perceptions based on the discussions in Day and Wensley (1988). There are 12 items used to measure competitive advantage, which are adapted from Sharma and Vredenburg (1998), Kamaluddin and Abdul Rahman (2009) and Sellers (2009).

4.3.2. Independent Variables

The survey instrument consists of 39 items of green intellectual capital dimensions and 12 items of competitive advantage. Previous studies have developed green and sustainable intellectual capital based on content analysis and Analytic Hierarchical Process (AHP) (Liu, 2010) and case study (Lopez-Gamero *et al.*, 2011). Similar to Chen (2008), the measures on green intellectual capital constructs in this study are adapted from intellectual capital, environmental management and green intellectual capital researches. In the current study, the data on independent variables, that are green intellectual capital dimensions are measured using a five-point likert scale ranging from strongly disagree (1) to strongly agree (5). Green human capital dimension incorporate 13 items, which are adapted from previous green intellectual capital research (Chen, 2008; Liu, 2010), intellectual capital research (Bontis, 1998; Sharabati *et al.*, 2010; Tseng and Goo, 2005) and environmental management research (Daily *et al.*, 2007; Klassen and Whybark, 1999; Unnikrishnan and Hegde, 2007). There are 9 items of green innovation capital, which adapted from Kamaluddin and Abdul Rahman (2009) and Sharabati *et al.* (2010). Green organizational capital were drawn from on Sharma and Vredenburg (1998), Buysse and Verbeke (2003), Menguc and Ozanne (2005), Sellers (2009), Chang and Chen (2012) and Sambasivan *et al.* (2013). Green relational Capital items consist of 10 items adapted from previous intellectual capital Sharabati *et al.* (2010) and environmental management studies (Chiou *et al.*, 2011; Sharma and Vredenburg, 1998).

4.3.4. Control Variables

Consistent with Kamaluddin and Abdul Rahman (2009), the current study controls for firm's size through number of full time employees and also age through number of years in operation. Age and size may differ with firm's performance. This is because the way that the firm develops its intellectual capital may differ with its age, and the increased access to resources and market power may influenced by the firm size (Youndt *et al.*, 2004). Similarly, intellectual capital had unusual high correlation with size (Juma, 2005).

4.4. Validity and Reliability of Measures

In measuring the variables of survey, testing validity of measures are performed by exploratory factor analysis (EFA). For green intellectual capital dimensions, the Kaiser-Meyer Olkin measure of sampling adequacy is 0.946 (above the recommended level of 0.6) and Bartlett's test of Spherecity is significant ($p<0.001$). The items for green human capital, green innovation capital, green organisational capital and green relational capital loaded on four factors with eigenvalues exceeding 1. These factors explain 66.14 percent of variance in the data (above the recommended minimum level of 0.60). As for the competitive advantage, the items loaded into 1 component explaining 69.59 of the total variance. The Bartlett's Test of Sphericity was significant and the Kaiser-Meyer-Olkin measure of sampling adequacy was 0.924, which was above the recommended value of 0.60. Reliability analysis was conducted in this study to ensure that the degree to which a variable or set of variables is consistent in what it is intended to measure (Hair *et al.*, 2010). In the current study, reliability was measured using Cronbach's alpha coefficients. The overall Cronbach's alpha coefficients of green intellectual capital and its dimensions (green human capital, green innovation capital, green organisational capital and green relational capital), and competitive

advantage are above 0.90. These values well exceed the minimum value of 0.70, which signifies that the data used for the study have an acceptable levels of reliability (Hair *et al.*, 2010).

5. Results and Findings

5.1. Descriptive Analysis

The descriptive statistical analysis is carried out to describe the characteristics of sample of this study. The respondents comprised 76.3% males and 23.7%% females. Majority of them are Chinese (49.6%), followed by Malays (41.1%), Indian (6.7%) and others (2.7%). Most of them are from the middle management level (72.8%) and the rest are from top management group (27.2%). The managers are involved in environmental management (40.2%), manufacturing and production (31.7%), general management (12.1%), research and development (3.6%) and others (6.7%). Most of the respondents (66.1%), have been with the firms for more than 10 years.

Table 1 presents the descriptive statistics of the four types of green intellectual capital dimensions. The table highlights that among the four green intellectual capital dimensions, green organisational capital had the highest mean of 3.86, followed by green human capital with the mean of 3.69, green relational capital of 3.44 and green innovation capital with the lowest mean of 3.08. The overall green intellectual capital mean is 3.55. The descriptive statistic results highlights that the Malaysian manufacturing managers perceive green organisational capital as the most important element in their organisation above other green intellectual capital construct. In general, the green intellectual capital of Malaysian manufacturing firm is slightly above the average scale.

Table-1. Descriptive Statistics of Green Human Capital, Green Innovation Capital, Green Organizational Capital and Overall Green Intellectual Capital

Variables	Number	Mean	Std. Dev.
Green Human Capital (GHC)	224	3.69	0.62
Green Innovation Capital (GNC)	224	3.08	0.75
Green Organizational Capital (GOC)	224	3.86	0.77
Green Relational capital (GRC)	224	3.44	0.71
Green Intellectual Capital (GIC)	224	3.55	0.62

Scale: Strongly disagree (1) to strongly agree (5)

5.2. Correlation Analysis

Correlation analysis is performed in the current study to explain the strength and direction (positive or negative) of the linear relationship between two variables (Pallant, 2013). In the current study, Pearson product-moment correlation is used because it is designed for interval (continuous) variables (Pallant, 2013). The association between green intellectual capital (green human capital, green innovation capital, green organisational capital and green relational capital), competitive advantage, organization age and number of employees are summarised in Table 2.The results show significant and positive relationships between the four green intellectual capital dimensions with competitive advantage. However, a negative relationship (r = -.042) and not significant association is found between all the four dimensions of green intellectual capital and competitive advantage with the control variable organization age. Nevertheless, it is discovered that there is a low correlation (r =.138) but significant association at the level p < 0.05) between all the four dimensions of green intellectual capital and competitive advantage with the control variable number of employees. The result also indicate that the coefficient correlations among green intellectual capital dimensions range between 0.525 and 0.724, means that all the coefficients are in moderate level and none of them is considered having substantial collinearity (0.9 or above) (Hair *et al.*, 2010). Thus, it seems that multicollinearity issue is not a problem in the current study.

Table-2. Correlations of Dimensions of Green Intellectual Capital and Competitive Advantage

No	Items	GHC	GNC	GOC	GRC	GIC	CA	OA	NE
1	GHC	1							
2	GNC	.596**	1						
3	GOC	.722**	.566**	1					
4	GRC	.647**	.716**	.724**	1				
5	GIC	.876**	.877**	.898**	.847**	1			
6	CA	.525**	.574**	.659**	.609**	.705**	1		
7	OA	.050	-.050	-.024	-.097	-0.33	-.042	1	
8	NE	.091	.049	.111	.120	.104	.138*	.179**	1

** Correlation is significant at the 0.01 level (2-tailed)

Where:

Org age = Organisation age; GHC = Green human capital; GNC = Green innovation capital; GOC = Green organisational capital; GRC = Green relational capital, Green Intellectual capital = Green Intellectual Capital, CA = Competitive advantage, OA = Organisation age; NE = Number of Employees

5.3. Multivariate Analysis

Table 3 summarises the multiple regression results of green intellectual capital and its dimensions; green human capital, green innovation capital, green relational capital and green relational capital on firms' competitive

advantage. As shown in model 1, the results indicate a significant positive relationship between green intellectual capital and competitive advantage (Adjusted R^2 =.487, F (3,320) = 71.575, p<.001). In general, the finding is consistent with those of Chen (2008), who find that green intellectual capital significantly affect firm's competitive advantage. The findings of the research also concordance with previous intellectual capital research in Malaysia that find positive and significant relationship between intellectual capital and firm's performance (Bontis et al., 2000; Kamaluddin and Abdul Rahman, 2009).

Table 3 also shows regression result of the four dimensions of green intellectual capital with firms' competitive advantage (model 2 Table 3). The results indicate a positive and significant relationship between green innovation capital, green organisational capital and green relational capital and competitive advantage. Green organisational capital contributed the most in explaining competitive advantage with standardised beta coefficient of 0.363, followed by green innovation capital (standardised beta coefficient of .228) and green relational capital (standardised beta coefficient of .188). Overall, this model explained 50.2% of the variance in the dependant variable and is significant at p<0.001). The findings indicate that Malaysian manufacturing managers come to an understanding that the strength in green organisational capital, green innovation capital and green relational capital are imperative to achieve competitive advantage. Unlike Chen (2008) study which indicate positive relationship between structural capital and competitive advantage, current study contributes to new findings as green structural capital are separated into green innovation capital and green organisational capital. Notably, green organisational capital has stronger relationship with firms' competitive advantage as compared to green innovation capital which implies that both green innovation and green organisational capital require different management. In addition, similar to Chen (2008) study, current findings indicate that there is a positive relationship between green relational capital and competitive advantage. This implies that knowledge embedded in relationships such as networking with customers, suppliers, other companies, government and NGOs to address environmental issues are vital to survive and maintain in the business.

Given the significant statistical evidence and the positive direction of the relationship, these results give support on H_{1b} (green innovation capital has a significant and positive relationship with competitive advantage), H_{1c} (green organizational capital has a significant and positive relationship with competitive advantage and H_{1d} (green relational capital has a significant and positive relationship with competitive advantage). However, H_{1a} (green human capital has positive but insignificant relationship with competitive advantage) is not supported in these results.

With regard to the control variables included in this study, Table 3 shows that firm age and firm size have no significant relationship with competitive advantage. The finding does not concurrent with Youndt *et al.* (2004) and Juma (2005) about the association between age of firm and firms' size respectively. However, the finding is consistent with Kamaluddin and Abdul Rahman (2009), which indicate that organisation age and size do not influence intellectual capital in Malaysia.

Table-3. The Regression Models of Firms' Competitive Advantage with Green Intellectual Capital and its Dimension

Model	**1**			**2**		
Variables	CA = β0 + β1Org age + β2Emp + β3GIC			CA = β0 + β1Org age + β2Emp + β3GHC + β4GNC + β5GOC + β6GRC		
Variables	Coeff. (B)	Std. Error	Beta	Coeff. (B)	Std. Error	Beta
Intercept	5.83	2.521		7.364	2.590	
Org age	-.226	.297	-.037	-.094	.298	-.015
Emp	.343	.235	.072	.281	.234	.059
GIC	.238***	.017	.691			
GHC				.020	.080	.019
GNC				.270**	.086	.228**
GOC				.376***	.083	.363***
GRC				.306*	.137	.188 *
R^2	.494			.515		
Adjusted R^2	.487			.502		
F	71.575***			38.405***		
df	(3,320)			(6217)		

*** significant at the 0.001 level, ** significant at the 0.01 level, * significant at the 0.05 level

Where:

Org age = organisation age; Emp = number of employees; Green Intellectual capital = Green intellectual capital; GHC = Green human capital; GNC = Green innovation capital; GOC = Green organisational capital; GRC = Green relational capital

6. Summary and Conclusion

The purpose of this paper is to examine the association between green intellectual capital and competitive advantage. Specifically, based on natural resource based view, this study examines on how green intellectual capital and its components affect firm's competitive advantage. The results of this study conclude that green intellectual capital has a positive and significant relationship with competitive advantage. The findings support the integration of both NRBV and intellectual capital theories, which highlight that the valuable, rare and imperfectly inimitable green intellectual capital resources to address the environmental issues leads to firms' competitive advantage. It is pointed

out that green intellectual capital is a significant business resource of Malaysian manufacturing firms to determine the survival and competitive success of any manufacturing business particularly in the knowledge and sustainable development era. Thus, manufacturing companies should concentrate more on developing and strengthening the accumulation and management of green intellectual capital resources in combating the environmental issues and sustaining their competitiveness.

This study provides various contributions to both researchers and practitioners. First, in terms of theoretical contribution, this study provide evidence that the integration of NRBV and intellectual capital are applicable in Malaysia, in particular the manufacturing industry. Secondly, this study integrated both the measurement streams and strategic streams. Variables are measured based on self-designed survey instrument that is relevant to research setting. The elements of each green intellectual capital dimension and competitive advantage developed in the study serves as important guideline for Malaysian manufacturing managers in managing their environmental management resources and also to be highlighted as the key performance drivers in preparing the integrated reporting. Thirdly, this current study contributes to the existing literature by classifying green intellectual capital into four constructs, namely green human capital, green innovation capital, green organizational capital and green relational capital. The separation of green structural capital into green innovation capital and green organizational capital and the different strength of relationship with competitive advantage indicates that these areas require different management's attention.

This study has some limitation that constrain the generalisation of its results and point areas of future research. First, it does not show in detail the interactions and value creating path towards value creation. Future research should provide broader insights into the value-creating capacity or interactions on green intellectual capital constructs in creating value. As pointed out from the finding, future research should consider other green intellectual capital construct such as green organisational capital as mediator between green human capital and competitive advantage. Second, current study concentrated on the Malaysian manufacturing companies. Thus, future research should investigate on other industries or countries to compare the results with the current study. Finally, the measurement variables are based on perceptive measures. Thus, future research would include more objective measures, including quantitative information.

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